MASS. Y3. MTC3: P91

UMASS/AMHERST
31206016462294

GOVERNMENT DOCUMENTS COLLECTION
FEB 01 1999
University of Massachusetts Depository Copy

Massachusetts
TECHNOLOGY
Collaborative

Preliminary Analysis of the Impact of FY 97 Federal R&D Budgets on the Massachusetts Economy

December 1996

Digitized by the Internet Archive
in 2015

https://archive.org/details/preliminaryanaly00mass

Preliminary Analysis of the Impact of FY 97 Federal R&D Budgets on the Massachusetts Economy

Background

Planning for Change, Preparing for Growth, an analysis prepared for the Massachusetts Technology Collaborative by the Economics Resource Group, Inc. (ERG) in spring, 1996, laid the groundwork for examining the impact of changes in federal R&D funding patterns on the Massachusetts economy. The analysis projected impacts on the state's economy as a result of changes in federal R&D support. A recommendation of that report was that a monitoring process be established to refine the scenarios used in the analysis. The FY 1997 federal budget, as recently approved by Congress and signed into law, provides the first real opportunity to update the analysis conducted by Adam Jaffe and his colleagues at ERG.

FY 97 Federal R&D Budget

Attachment A provides a summary of the final appropriations impacting R&D which were signed into law for the federal fiscal year starting October 1, 1996. This summary was prepared by the American Association for the Advancement of Science (AAAS) and represents the first comprehensive published analysis of R&D appropriations on an agency-by-agency basis. Total R&D appropriations are projected to be $74 billion (*Budget Authority*), a 4.1% increase over the comparable FY 96 figure. Every major R&D funding agency except for NASA and the Department of Interior received funding increases over FY 96. R&D funding at the Department of Defense is projected to increase 4.9%. NIH funding will increase by 6.9%. On the surface, these appropriations represent good news to the R&D community and to the Massachusetts economy. As depicted in *Figure 1*, this represents the first significant increase in overall federal R&D funding since 1993. *Table B* in *Attachment A* shows that in constant dollar terms, however, many agencies are still operating significantly below 1994 funding levels. Of local importance, the three R&D funding agencies providing the highest level of support to Massachusetts organizations (DoD, HHS/NIH, and NSF) have received level or better funding in both real or constant dollar terms.

Projected Impact of Federal Funding on Massachusetts

Table 1 and *Figure 2* project the impact of these federal funding trends at the local level. Table 1 shows the potential effect of agency-by-agency growth patterns at the national level applied to FY 94 actual *obligations* for Massachusetts. These project potential modest gains for organizations receiving funding from DoD and NSF, while those receiving support from HHS/NIH stand to gain by almost 15%.

Although these projections are encouraging, it should be recognized that agency level projections cannot take into account year-to-year changes at the program level, some of which can be quite significant. Massachusetts typically fares very well (often second only to California) in major multiple award programs such as the Technology Reinvestment Project (TRP), Advanced Technology Program (ATP), and Small Business Innovation Research Program (SBIR and STTR). TRP and ATP have been scaled back or eliminated during the past three years, while the SBIR program has increased by 25%.

Figure 1

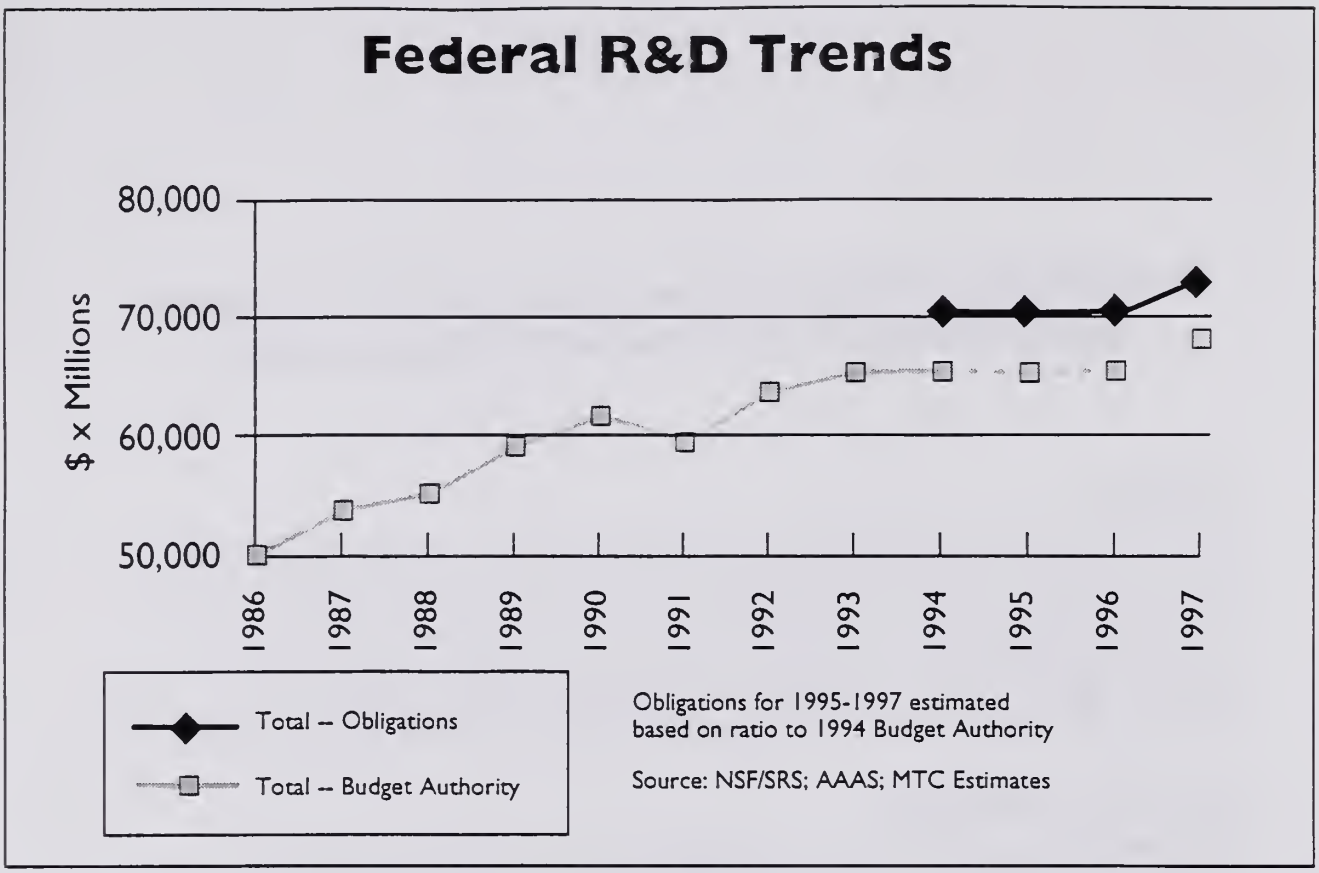

Figure 2

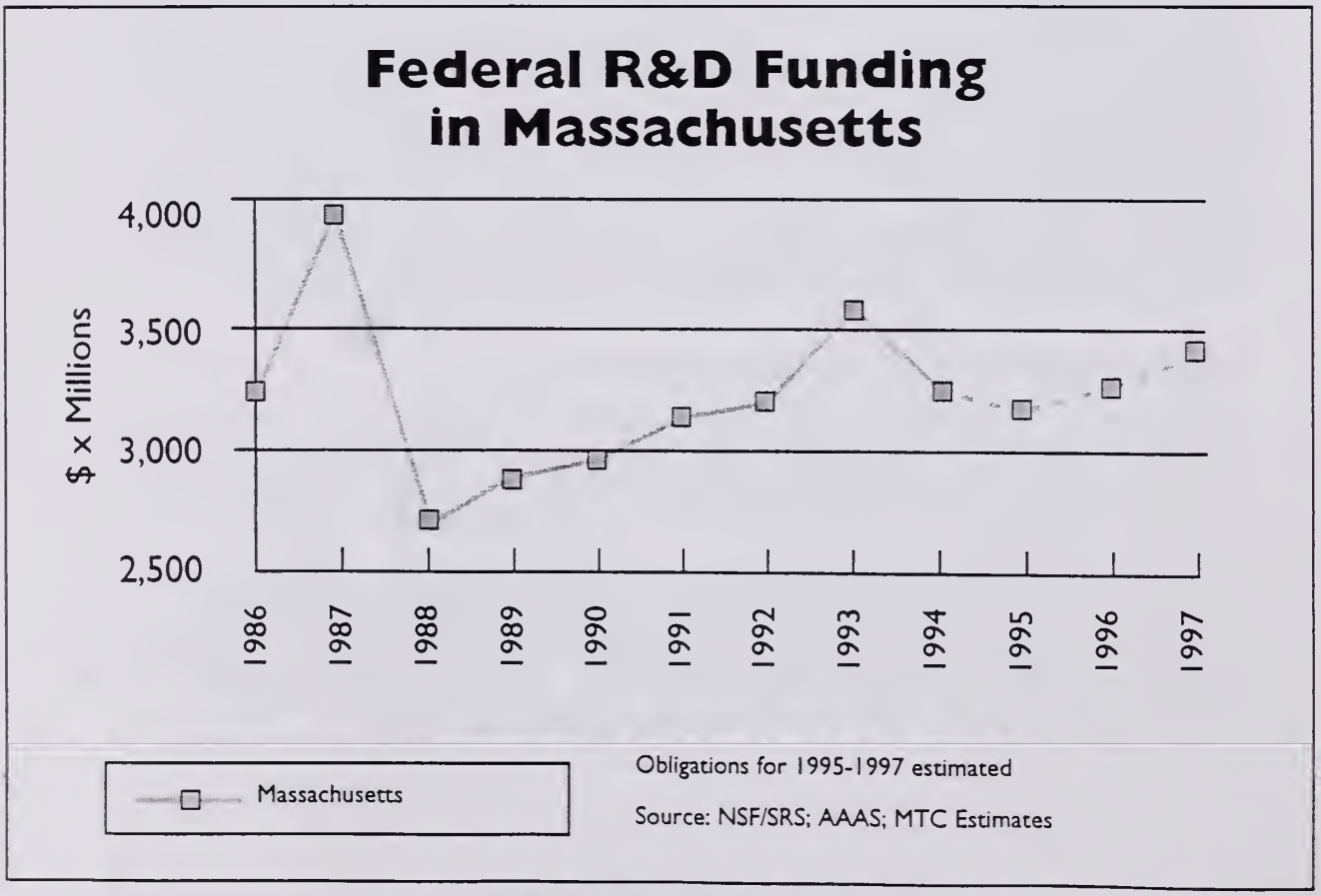

Table 1

Projections for Federal R&D Funding in Massachusetts

(Obligations, $x1000)

	1994	1995	1996	1997
	Actuals		Projections	
US Total	65,842,900	*65,726,000*	*65,877,000*	*68,553,000*
Massachusetts, total $	3,234,051	*3,169,180*	*3,220,814*	*3,389,165*
Massachusetts, % of US Total	4.91%	*4.82%*	*4.89%*	*4.94%*
Department of Agriculture	21,664	*21,079*	*21,100*	*21,860*
Department of Commerce	38,499	*42,118*	*35,084*	*37,786*
Department of Defense, research 2/.	393,866	*374,173*	*379,411*	*398,002*
Department of Defense, total		-	-	-
development 3/ 4/.	1,425,655	*1,354,372*	*1,373,333*	*1,440,627*
Department of Energy	88,862	*84,241*	*79,524*	*82,307*
Department of Health & Human Svcs	901,577	*916,904*	*961,832*	*1,034,931*
Department of the Interior	6,471	*6,109*	*5,693*	*5,243*
Department of Transportation	41,788	*43,418*	*39,206*	*40,814*
Environmental Protection Agency	19,823	*18,673*	*17,814*	*20,005*
National Aeronautics and Space Admin	126,941	*127,703*	*127,064*	*125,031*
National Science Foundation	168,905	*180,391*	*180,751*	*182,559*

Source: AAAS; MTC Projections

Analysis of Potential Impact of Federal Funding Trends on Massachusetts Research Universities

Approximately 20% of the $4.1 billion in federally supported research is conducted by Massachusetts research universities. Another 12% is conducted by hospitals and medical research institutes. Together, these institutions provide the basic research core which supports the *Massachusetts System of Innovation* described by Dr. Jaffe. Massachusetts is especially dependent upon federal funding for this core activity: 72% of university research in Massachusetts is federally funded, compared with 60% nationally.

Table 2 provides an agency-by-agency breakdown of federal funds received by Massachusetts universities in FY 94, the most recent year for which such analysis is available. These figures were developed from the annual statistics compiled by the National Science Foundation Scientific Research Service (SRS). MIT, Harvard, Boston University, and Woods Hole Oceanographic Institute receive over 75% of the state's federal funding for science and engineering. Unlike many states, Massachusetts universities receive funding from a broad range of federal agencies. This diversity is often an asset, but has tended to work against Massachusetts in the current funding climate at a time when only one agency (HHS/NIH) is receiving significant increases while others are receiving level (DoD, NSF) or decreasing funding (DoE, NASA).

Table 2

Federal obligations for science and engineering research and development to universities and colleges, by state, institution and agency

Fiscal years 1994-1997
[Thousand of dollars]
(Source: NSF/SRS - edited by MTC)

State and institution	% of Mass Total	Total	USDA	Com	DoD 1/	Ed	DOE	EPA	HHS	NASA	NSF	Other 2/	Exposure Index (a) FY 95	Exposure Index (b) FY 96	Exposure Index (c) FY 97	Expoaure Index (d) Const 94$	Change Const FY94 $
United States, total - Fed University R&D Fundi		11,768,416	470,063	84,156	1,600,586	33,887	580,985	134,603	6,402,384	634,500	1,679,229	148,023	1.013	1.023	1.097	1.010	120,518
US - Agency Distribution (%)		100.00%	3.99%	0.72%	13.60%	0.29%	4.94%	1.14%	54.40%	5.39%	14.27%	1.26%					
Massachusatta, total		**781,635**	**18,187**	**3,527**	**113,226**	**1,207**	**78,971**	**6,140**	**354,567**	**49,418**	**149,389**	**7,003**	**1.013**	**1.017**	**1.091**	**0.999**	**(857)**
Massachusatta % of US Total		**6.64%**	**3.87%**	**4.19%**	**7.07%**	**3.56%**	**13.59%**	**4.56%**	**5.54%**	**7.79%**	**8.90%**	**4.73%**					
Massachusetts - Agency Distribution (%)		**100.00%**	**2.33%**	**0.45%**	**14.49%**	**0.15%**	**10.10%**	**0.79%**	**45.36%**	**6.32%**	**19.11%**	**0.90%**					
American Intl College	0.00%	6	0	0	0	0	0	0	0	0	6	0	1.066	1.003	1.052	0.999	(0)
Amherst College	0.13%	986	206	0	19	0	0	0	107	0	654	0	1.040	1.008	1.066	0.991	(9)
Assumption College	0.01%	95	0	0	0	0	0	0	0	0	95	0	1.066	1.003	1.052	0.999	(0)
Bentley College	0.03%	250	0	0	0	0	0	0	0	0	250	0	1.066	1.003	1.052	0.999	(0)
Boston College	**1.01%**	**7,897**	**0**	**0**	**2,903**	**0**	**384**	**112**	**1,976**	**38**	**2,131**	**353**	**1.015**	**1.009**	**1.085**	**0.988**	**(91)**
BC - % of Massachusatta Total		**1.01%**	**0.00%**	**0.00%**	**2.56%**	**0.00%**	**0.49%**	**1.82%**	**0.56%**	**0.08%**	**1.43%**	**5.04%**					
BC - Agency Distribution (%)		**100.00%**	**0.00%**	**0.00%**	**36.76%**	**0.00%**	**4.86%**	**1.42%**	**25.02%**	**0.48%**	**26.98%**	**4.47%**					
Boston University	**9.96%**	**77,844**	**173**	**0**	**6,606**	**560**	**2,974**	**50**	**56,369**	**1,709**	**9,403**	**0**	**1.016**	**1.034**	**1.105**	**1.032**	**2,530**
BU - % of Massachusatta Total		**9.96%**	**0.95%**	**0.00%**	**5.83%**	**46.40%**	**3.77%**	**0.81%**	**15.90%**	**3.46%**	**6.29%**	**0.00%**					
BU - Agency Distribution (%)		**100.00%**	**0.22%**	**0.00%**	**8.49%**	**0.72%**	**3.82%**	**0.06%**	**72.41%**	**2.20%**	**12.08%**	**0.00%**					
Brandeis University	**2.47%**	**19,342**	**0**	**0**	**472**	**0**	**1,226**	**0**	**13,007**	**375**	**4,262**	**0**	**1.021**	**1.031**	**1.100**	**1.029**	**559**
Brandeis - % of Massachusatta Total		**2.47%**	**0.00%**	**0.00%**	**0.42%**	**0.00%**	**1.55%**	**0.00%**	**3.67%**	**0.76%**	**2.85%**	**0.00%**					
Brandeis - Agency Distribution (%)		**100.00%**	**0.00%**	**0.00%**	**2.44%**	**0.00%**	**6.34%**	**0.00%**	**67.25%**	**1.94%**	**22.03%**	**0.00%**					
Bridgewater State College	0.03%	222	0	0	0	0	0	0	75	31	116	0	1.040	1.017	1.071	1.007	2
Clark University	0.18%	1,439	0	40	104	0	223	58	486	118	410	0	1.016	1.003	1.086	0.983	(24)
Col of the Holy Cross	0.04%	325	0	0	0	0	0	0	128	0	197	0	1.046	1.021	1.079	1.023	7
Five Colleges Inc	0.00%	28	0	0	0	0	0	0	0	0	28	0	1.066	1.003	1.052	0.999	(0)
Franklin Inst Boston	0.00%	19	0	0	0	0	0	0	0	0	19	0	1.066	1.003	1.052	0.999	(0)
Greenfield Community Col	0.01%	83	0	0	0	0	0	0	0	0	83	0	1.066	1.003	1.052	0.999	(0)
Hampshire College	0.05%	360	0	0	0	0	0	0	105	0	255	0	1.051	1.016	1.072	1.017	6
Harvard University	**24.32%**	**190,125**	**120**	**208**	**8,269**	**0**	**4,977**	**3,140**	**145,896**	**6,289**	**21,053**	**173**	**1.017**	**1.036**	**1.108**	**1.037**	**7,049**
Harvard - % of Massachusatta Total		**24.32%**	**0.66%**	**5.90%**	**7.30%**	**0.00%**	**6.30%**	**51.14%**	**41.15%**	**12.73%**	**14.09%**	**2.47%**					
Harvard - Agency Distribution (%)		**100.00%**	**0.06%**	**0.11%**	**4.35%**	**0.00%**	**2.62%**	**1.65%**	**76.74%**	**3.31%**	**11.07%**	**0.09%**					
MA Inst of Technology	**34.21%**	**267,404**	**158**	**1,487**	**56,831**	**0**	**62,400**	**1,309**	**59,158**	**37,701**	**43,711**	**4,649**	**1.001**	**0.997**	**1.078**	**0.957**	**(11,385)**
MIT - % of Massachusatta Total		**34.21%**	**0.87%**	**42.16%**	**50.19%**	**0.00%**	**79.02%**	**21.32%**	**16.68%**	**76.29%**	**29.26%**	**66.39%**					
MIT - Agency Distribution (%)		**100.00%**	**0.06%**	**0.56%**	**21.25%**	**0.00%**	**23.34%**	**0.49%**	**22.12%**	**14.10%**	**16.35%**	**1.74%**					
Middlesex Cmty Col MA	0.04%	348	0	0	0	0	0	0	0	0	348	0	1.066	1.003	1.052	0.999	(0)
Mount Holyoke College	0.08%	614	0	0	0	0	72	0	0	116	426	0	1.040	0.994	1.049	0.965	(21)
Northeastern University	**1.55%**	**12,126**	**180**	**0**	**2,567**	**0**	**846**	**111**	**3,291**	**22**	**5,109**	**0**	**1.026**	**1.013**	**1.082**	**0.999**	**(8)**
NU - % of Massachusatts Total		**1.55%**	**0.99%**	**0.00%**	**2.27%**	**0.00%**	**1.07%**	**1.81%**	**0.93%**	**0.04%**	**3.42%**	**0.00%**					
NU - Agency Distribution (%)		**100.00%**	**1.48%**	**0.00%**	**21.17%**	**0.00%**	**6.98%**	**0.92%**	**27.14%**	**0.18%**	**42.13%**	**0.00%**					
Radcliffe College	0.05%	367	0	0	367	0	0	0	0	0	0	0	0.994	1.015	1.092	0.978	(8)
Roxbury Community College	0.00%	1	0	0	0	0	0	0	0	0	0	1	0.986	0.869	1.016	0.781	(0)
Salem State College	0.01%	75	0	0	0	0	0	0	75	0	0	0	1.015	1.050	1.121	1.060	5
Simmons College	0.08%	634	0	0	0	0	0	0	574	0	60	0	1.020	1.045	1.114	1.055	35
Smith College	0.07%	571	0	0	21	0	0	0	320	0	230	0	1.035	1.029	1.092	1.033	19
Suffolk University	0.02%	147	0	0	0	147	0	0	0	0	0	0	0.986	0.869	1.016	0.781	(32)
Tufts University	**5.78%**	**45,144**	**12,515**	**0**	**1,739**	**500**	**999**	**369**	**27,202**	**25**	**1,795**	**0**	**1.002**	**1.028**	**1.103**	**1.011**	**483**
Tufts - % of Massachusetts Total		**5.78%**	**68.81%**	**0.00%**	**1.54%**	**41.43%**	**1.27%**	**6.01%**	**7.67%**	**0.05%**	**1.20%**	**0.00%**					
Tufts - Agency Distribution (%)		**100.00%**	**27.72%**	**0.00%**	**3.85%**	**1.11%**	**2.21%**	**0.82%**	**60.26%**	**0.06%**	**3.98%**	**0.00%**					

Table 2

Federal obligations for science and engineering research and development to universities and colleges, by state, institution and agency

State and institution		Total	USDA	Com	DoD 1/	Ed	DOE	EPA	HHS	NASA	NSF	Other 2/					
U MA Amherst	**4.30%**	**33,628**	**3,827**	**0**	**5,510**	**0**	**1,982**	**519**	**6,687**	**1,708**	**12,946**	**449**	**1.020**	**1.007**	**1.077**	**0.983**	**(564)**
UMass A - % of Massachusetts Total		**4.30%**	**21.04%**	**0.00%**	**4.87%**	**0.00%**	**2.51%**	**8.45%**	**1.89%**	**3.46%**	**8.67%**	**6.41%**					
UMass A - Agency Distribution (%)		**100.00%**	**11.38%**	**0.00%**	**16.39%**	**0.00%**	**5.89%**	**1.54%**	**19.89%**	**5.08%**	**38.50%**	**1.34%**					
U MA Boston	0.34%	2,651	189	0	389	0	108	28	1,202	0	735	0	1.020	1.023	1.093	1.012	33
U MA Central Office	0.07%	551	0	229	0	0	0	0	0	0	0	322	1.030	0.854	1.060	0.833	(92)
U MA Dartmouth	0.30%	2,377	819	0	80	0	0	0	0	0	1,478	0	1.031	1.003	1.062	0.975	(59)
U MA Lowell	0.50%	3,911	0	0	1,399	0	259	273	1,074	152	704	50	1.006	1.011	1.093	0.988	(47)
U MA Worcester	**4.79%**	**37,460**	**0**	**0**	**678**	**0**	**0**	**0**	**35,901**	**0**	**881**	**0**	**1.016**	**1.048**	**1.118**	**1.058**	**2,135**
UMass W - % of Massachusetts Total		**4.79%**	**0.00%**	**0.00%**	**0.60%**	**0.00%**	**0.00%**	**0.00%**	**10.13%**	**0.00%**	**0.59%**	**0.00%**					
UMass W - Agency Distribution (%)		**100.00%**	**0.00%**	**0.00%**	**1.81%**	**0.00%**	**0.00%**	**0.00%**	**95.84%**	**0.00%**	**2.35%**	**0.00%**					
Wellesley College	0.15%	1,171	0	0	0	0	0	71	745	49	306	0	1.024	1.029	1.101	1.030	35
Wentworth Inst of Tech	0.16%	1,236	0	0	1,085	0	0	0	0	0	151	0	1.003	1.013	1.087	0.981	(24)
Wheelock College	0.02%	147	0	0	0	0	0	0	0	0	147	0	1.066	1.003	1.052	0.999	(0)
Williams College	0.07%	580	0	0	0	0	0	0	82	0	498	0	1.059	1.009	1.061	1.007	4
Woods Hole Oceangrophic	**8.55%**	**66,791**	**0**	**1,494**	**21,362**	**0**	**2,063**	**0**	**107**	**1,008**	**40,206**	**551**	**1.038**	**1.000**	**1.066**	**0.983**	**(1,164)**
WHOI - % of Massachusetts Total		**8.55%**	**0.00%**	**42.36%**	**18.87%**	**0.00%**	**2.61%**	**0.00%**	**0.03%**	**2.04%**	**26.91%**	**7.87%**					
WHOI - Agency Distribution (%)		**100.00%**	**0.00%**	**2.24%**	**31.98%**	**0.00%**	**3.09%**	**0.00%**	**0.16%**	**1.51%**	**60.20%**	**0.82%**					
Worcester Polytech Inst	0.60%	4,680	0	69	2,825	0	458	100	0	77	696	455	1.000	0.988	1.078	0.947	(249)
																	(857)
United States - total University Funding -		**11,768,416**	**470,063**	**84,156**	**1,600,586**	**33,887**	**580,985**	**134,603**	**6,402,384**	**634,500**	**1,679,229**	**148,023**					
% of total Agency R&D Funding - FY 94		**16.6%**	**30.8%**	**8.2%**	**4.5%**	**N/A**	**8.6%**	**22.9%**	**56.5%**	**6.7%**	**74.9%**	**5.5%**					
United States - total Agency R&D Funding -		**71,074,000**	**1,528,000**	**1,022,000**	**35,510,000**		**6,771,000**	**588,000**	**11,324,000**	**9,406,000**	**2,243.000**	**2,684,000**					
United States - total Agency R&D Funding -		**70,948,000**	**1,487,000**	**1,118,000**	**35,349,000**		**6,416,000**	**554,000**	**11,517,000**	**9,459,000**	**2,396.000**	**2,652,000**	**0.999**				
Agency Growth Index - 94-95		**0.998**	**0.973**	**1.094**	**0.995**	**0.988**	**0.948**	**0.942**	**1.017**	**1.006**	**1.068**	**0.988**					
United States - total Agency R&D Funding -		**71,111,000**	**1,489,000**	**932,000**	**35,842,000**		**6,057,000**	**528,000**	**12,077,000**	**9,416,000**	**2,400,000**	**2,370,000**	**1.003**				
Agency Growth Index - 95-96		**1.002**	**1.001**	**0.833**	**1.014**	**0.869**	**0.944**	**0.954**	**1.049**	**0.995**	**1.002**	**0.869**					
Agency Growth Index - 94-96		**1.001**	**0.974**	**0.912**	**1.009**	**0.883**	**0.895**	**0.898**	**1.066**	**1.001**	**1.070**	**0.883**					
United States - total Agency R&D Funding -		**73,999,000**	**1,543,000**	**1,004,000**	**37,592,000**		**6,269,000**	**593,000**	**12,998,000**	**9,263,000**	**2,424,000**	**2,312,000**	**1.041**				
Agency Growth Index - 96-97		**1.041**	**1.036**	**1.077**	**1.049**	**0.976**	**1.035**	**1.123**	**1.076**	**0.984**	**1.010**	**0.976**					
Agency Growth Index - 94-97		**1.041**	**1.010**	**0.982**	**1.059**	**0.861**	**0.926**	**1.009**	**1.148**	**0.985**	**1.081**	**0.861**					
Agency Growth Index - Const $ FY94-97		**0.981**	**0.951**	**0.925**	**0.997**	**0.796**	**0.872**	**0.950**	**1.081**	**0.928**	**1.018**	**0.796**					

a) Exposure Index FY 95 based weighted increases in FY 95 funding against FY 94 actuals
a) Exposure Index FY 96 based weighted increases in FY 96 funding against FY 95 projections
a) Exposure Index FY 95 based weighted increases in FY 97 authorizations against FY 96 projections
a) Exposure Index Const FY 94 $ based weighted increases in FY 97 funding against FY 94 actuals in constant FY 94 $

MTC has developed an *exposure index* for each university in order to project the potential impact of shifts in federal R&D support at the national level to each local university and college. The *exposure index* (EI) projects the relative change in funding potentially available to the university, based on changes in agency funding at the national level.[1] These *exposure indices* have been calculated based on both current and constant (1994) dollars.

An *exposure index* of "1.0" indicates that the organization might expect to receive the same level of funding in the current period as in the base period. An *exposure index* greater than "1.0" indicates that the organization might expect to receive more funding, based on agency funding trends; an *exposure index* less than "1.0" indicates a reduction in funding at the agency level when compared to the base period. It must be noted that the *exposure index* is an analytical tool, not a projection of actual funds received by a specific university. This tool allows us to develop both a qualitative and quantitative understanding of potential impacts of federal funding shifts.

The far right column of *Table 2* calculates a change in potential funding for each university, based on the FY 94-97 constant dollar *exposure index* and the base funding received by that university in FY 94. These calculations show that Massachusetts universities are in a relatively weak funding position when compared to the nation as a whole because of the diverse funding mix. In constant dollars, at the national level funding available to support university research is expected to increase by $120 million in FY 97, when compared with the FY 94 base year. Massachusetts, on the other hand, shows a projected net decrease of $857,000 on the same basis.

A review of the potential impact of shifts in federal funding on each university or college shows two dramatic trends. Those universities with a medical school (Harvard, BU, Tufts, and U Mass) should see strong benefits from the current positive funding cycle experienced by the National Institutes of Health. MIT and the other traditional engineering schools which have relied on DoD and DoE for support may be experiencing sharp declines in available funding. This could be particularly troublesome for some of the smaller colleges and universities, including those who receive support from the smaller agencies.

Conclusions

Planning for Growth, Preparing for Change analyzed the potential impact of two scenarios on the Massachusetts economy: a constant funding scenario and a declining funding scenario. The funding patterns for FY 94-96 suggest that, in aggregate, Massachusetts is facing the constant funding scenario. This scenario was projected to have an annual $1 billion negative impact on the local economy by the year 2002. It remains to be seen whether the FY 97 budget represents a return to a more aggressive support of the research and development community or a momentary respite. There is every indication and expectation that out-year funding for science and technology - even for popular agencies like the NIH - will be squeezed as part of the ongoing efforts of the Administration and Congress to eliminate/reduce the federal budget deficit. Under either the President's or Congress's plan, R&D funding will be reduced by about 20% by the year 2002, according to AAAS projections. *This points out the need for continuing monitoring and assessment of federal R&D trends.* The diversity of R&D performers within the Commonwealth suggests that, on balance, Massachusetts may be able to adapt successfully to changes in federal funding patterns. However, the analysis of the potential impact on the university community also confirms that there are likely to be winners and losers as these shifts take place.

The shift in federal funding patterns towards the life sciences represents both a challenge and an opportunity. Despite cost constraints, the healthcare industry continues to represent a significant, growing

---

[1] The *Exposure Index (EI)* is computed as:

$$EI = \sum (F_{ib} \times GF_i) / \sum F_{ib}$$

where F_{ib} is the funding received by the *university* during the base period from each agency (i) and GF_i is the growth factor (ratio of current period funding for the agency to base period funding) for the *agency* at the national level.

market. With its portfolio of medical schools, teaching hospitals, biotech, and medical device companies, Massachusetts should be well positioned to take advantage of the additional funding available from federal sources. Increased emphasis in these sectors on sophisticated signal processing, manufacturing process control technology, and information technology should provide new opportunities for Massachusetts companies and their employees from other sectors of the economy. Massachusetts faces three distinct challenges in leveraging available federal R&D funding for future economic growth:

- Identifying significant new opportunities and increasing its share of awards within the diffuse network of HHS/NIH, DoD, DoE and NSF funded life science programs,
- Establishing effective partnerships among the academic and small technology entrepreneurs, who are typically eligible for federal grants from these agencies, and organizations with the financial resources and channels to bring the technologies to market, and
- Capturing the economic benefit that results from the transformation of life science technology into manufacturing jobs within the Commonwealth.

ATTACHMENT A

AAAS Preliminary Analysis of R&D in FY 1997 Appropriations:

Congress Appropriates $74 Billion for R&D in FY 1997,
a 4.1 Percent Increase

A preliminary AAAS analysis of FY 1997 appropriations, which were finalized on September 30, just hours before the start of fiscal year 1997, shows that **total federal R&D** for FY 1997 is $74.0 billion, $2.9 billion or 4.1 percent more than FY 1996. Every major R&D funding agency except NASA an the Department of the Interior received increases, including a $1.8 billion or 4.9 percent increase for R&D at the Department of Defense (DOD) and a $785 million or 6.9 percent increase for R&D at the National Institutes of Health (NIH).

- Table A summarizes congressional action on R&D in FY 1997. Total **defense R&D** comes to $40.5 billion in FY 1997, $2 billion or 5.2 percent more than FY 1996 and a similar amount above the request. DOD s R&D totals $37.6 billion (up $1.8 billion or 4.9 percent) due to large increases for the Air Force and the Ballistic Missile Defense Organization. Defense-related R&D at the Department of Energy (DOE) jumps 10 percent to $2.9 billion.

- **Nondefense R&D** for FY 1997 totals $33.5 billion, an $879 million or 2.7 percent increase over FY 1996. The bulk of the increase goes to NIH, which continues to enjoy strong, bipartisan support. Its 6.9 percent increase for FY 1997 follows a 6.3 percent increase last year.

- Two agencies whose R&D programs were cut by Congress last year recovered lost ground this year: EPA s R&D increases by 12.3 percent to $593 million, and the Department of Commerce s R&D totals $1.0 billion, a 7.7 percent jump.

- The National Science Foundation s R&D inches up 1.0 percent to $2.4 billion, with cuts in NSF s support for R&D facilities offsetting gains in its support for basic research.

- Federal support for **basic research** is $14.8 billion in FY 1997, 2.7 percent or $395 million above FY 1996 and 0.9 percent above the President s request. NIH continues to provide the majority of federal support for basic research, with $6.9 billion (up 6.4 percent), followed by NSF ($2.1 billion, up 2.5 percent) and DOE ($2.0 billion, up 2.3 percent). NASA s support of basic research falls by 4.7 percent to $1.8 billion, and DOD s basic research declines by 5 percent to $1.1 billion.

- In June, Congress approved its FY 1997 budget resolution, which established spending targets for FY 1997 and a plan to balance the budget by FY 2002. Contained in the resolution were a number of program-level funding assumptions for nondefense programs. The AAAS analysis of the budget resolution showed that if the budget resolution s assumptions had been followed in appropriations, nondefense R&D would have been $32.2 billion in FY 1997. Table C shows that instead, nondefense R&D is $33.5 billion, $1.3 billion higher than projected.

- Appropriators rearranged the spending priorities outlined in the budget resolution to favor some areas of R&D. NIH received nearly $780 million more than projected because of strong support from Sen. Mark Hatfield (R-OR) and Rep. John Porter (R-IL), who chair the subcommittees responsible for NIH appropriations. Commerce s R&D is $124 million higher than projected because appropriators backed off from the budget resolution s plan to eliminate the Advanced Technology Program.

- Despite increases in the FY 1997 budget, Table B shows that FY 1997 only partially recovers ground lost to inflation and spending cuts over the past few years. The $74.0 billion for total R&D in FY 1997 comes after three consecutive years of level funding at about $71 billion, resulting in a net loss to inflation of 1.9 percent between FY 1994 and FY 1997. (FY 1994 was chosen as the starting point because it is the last fiscal year reflecting the imprint of the 103rd Congress. FY 1995 appropriations were approved by the 103rd Congress, but the 104th Congress enacted nearly $2 billion in rescissions in 1995, rearranging the budget to reflect its priorities.)

- Table B shows that from FY 1994 to FY 1997, only NIH and NSF managed to keep their R&D budgets ahead of inflation. NIH s R&D budget has increased by 16.7 percent between FY 1994 and 1997, a 10 percent gain after inflation, while NSF s gain is 1.8 percent after inflation. During this time, total nondefense R&D has fallen by 3.6 percent after inflation while defense R&D is 0.5 percent lower in FY 1997 compared to FY 1994 after inflation.

- These figures show that although federal support for R&D has not suffered the dramatic cuts projected in the balanced budget plans of both the President and Congress, federal R&D, with the notable exception of NIH, has entered an age of steady or declining budgets. This mirrors the state of total discretionary spending in the budget, which has hovered around the $500 billion level since FY 1994. Nearly all of the deficit reduction accomplished during the 104th Congress has come from discretionary spending, which now accounts for less than third of the federal budget.

This report is a preliminary analysis of the enacted FY 1997 budget. Final data on FY 1997 appropriations for R&D, a complete analysis of the implications of the FY 1997 budget for R&D, and detailed funding tables and explanatory text for the major R&D funding agencies will be available in the AAAS publication *Congressional Action on R&D in the FY 1997 Budget*. The tentative publication date is November 1. To order a copy of the report, please contact Shirley Young at syoung@aaas.org (phone: 202-326-6612; fax: 202-289-4950) or send a check for $14.95 ($10.95 plus $4.00 shipping and handling; $12.75 total for AAAS members) to Shirley Young, Directorate for Science and Policy Programs, AAAS, 1200 New York Ave., NW, Washington, DC, 20005.

-October 7, 1996
AAAS R&D Budget and Policy Project

Table A. Total R&D by Agency (Preliminary - Oct. 7, 1996)
Congressional Action on R&D in the FY 1997 Budget
(budget authority in millions of dollars)*

	FY 1996 Est. [1]	FY 1997 Request	Action by Congress: FY 1997 Approved	Change from Request: Amount	Change from Request: Percent	Change from FY 1996: Amount	Change from FY 1996: Percent
Defense (military)	35,842	35,522	37,592	2,070	5.8%	1,750	4.9%
National Aeronautics and Space Admin.	9,416	9,700	9,263	-437	-4.5%	-153	-1.6%
Energy	6,057	6,604	6,269	-335	-5.1%	212	3.5%
Health and Human Services	12,077	12,620	12,998	378	3.0%	921	7.6%
National Institutes of Health	*11,443*	*11,901*	*12,227*	*327*	*2.7%*	*785*	*6.9%*
National Science Foundation	2,400	2,479	2,424	-55	-2.2%	24	1.0%
Agriculture	1,489	1,495	1,543	48	3.2%	54	3.6%
Interior	622	580	573	-7	-1.1%	-49	-7.9%
Transportation	602	671	626	-44	-6.6%	25	4.1%
Environmental Protection Agency	528	628	593	-35	-5.5%	65	12.3%
Commerce	932	1,226	1,004	-222	-18.1%	72	7.7%
All Other	1,146	1,207	1,113	-94	-7.8%	-32	-2.8%
TOTAL R&D	71,111	72,731	73,999	1,268	1.7%	2,888	4.1%
Defense R&D	38,444	38,260	40,454	2,194	5.7%	2,009	5.2%
Nondefense R&D	32,667	34,471	33,546	-926	-2.7%	879	2.7%
Basic Research	14,431	14,700	14,825	126	0.9%	395	2.7%

*Authors' estimates. Includes conduct of R&D and R&D facilities.
NASA and DOE totals include allowances for full funding of fixed assets.
[1] Includes rescissions and supplementals enacted in FY 1997 omnibus appropriations (Public Law 104-208).

Preliminary - Complete information will be available in the forthcoming
Congressional Action on R&D in the FY 1997 Budget.

Table B. Trends in R&D, FYs 1994-97
(Preliminary - Oct. 7, 1996) (budget authority in millions of dollars)

	FY 1994 Actual	FY 1995 Actual*	FY 1996 Est.**	FY 1997 Approved	Change FY 1994-95	Change FY 1995-96	Change FY 1996-97	3-Year Change FY 1994-97	3-Year Change FY 1994-97 CONSTANT $***
Dept. of Defense	35,510	35,349	35,842	37,592	-0.5%	1.4%	4.9%	5.9%	-0.3%
NASA	9,406	9,459	9,416	9,263	0.6%	-0.5%	-1.6%	-1.5%	-7.2%
Dept. of Energy	6,771	6,416	6,057	6,269	-5.2%	-5.6%	3.5%	-7.4%	-12.8%
HHS	11,324	11,517	12,077	12,998	1.7%	4.9%	7.6%	14.8%	8.1%
National Institutes of Health	*10,474*	*10,762*	*11,443*	*12,227*	*2.8%*	*6.3%*	*6.9%*	*16.7%*	*10.0%*
Nat'l Science Foundation	2,243	2,396	2,400	2,424	6.8%	0.2%	1.0%	8.1%	1.8%
Agriculture	1,528	1,487	1,489	1,543	-2.7%	0.1%	3.6%	1.0%	-4.9%
Interior	708	668	622	573	-5.6%	-6.8%	-7.9%	-19.0%	-23.7%
Transportation	641	666	602	626	3.9%	-9.7%	4.1%	-2.2%	-7.9%
EPA	588	554	528	593	-5.8%	-4.6%	12.3%	0.9%	-5.0%
Commerce	1,022	1,118	932	1,004	9.4%	-16.7%	7.7%	-1.8%	-7.5%
All Other	1,335	1,318	1,146	1,113	-1.3%	-13.1%	-2.8%	-16.6%	-21.4%
Total R&D	71,074	70,948	71,111	73,999	-0.2%	0.2%	4.1%	4.1%	-1.9%
Defense R&D	38,299	37,833	38,444	40,454	-1.2%	1.6%	5.2%	5.6%	-0.5%
Nondefense R&D	32,775	33,115	32,667	33,546	1.0%	-1.4%	2.7%	2.4%	-3.6%
Basic Research	13,693	13,772	14,431	14,825	0.6%	4.8%	2.7%	8.3%	2.0%

Source: AAAS analysis of R&D as contained in FY 1997 appropriations bills.
FY 1994-1996 data from AAAS publications, based on OMB figures for R&D as reported by agencies.
* - The 104th Congress enacted nearly $2 billion in rescissions to FY 1995 R&D in April and July, 1995.
** - Includes rescissions and supplementals enacted in Public Law 104-134 and FY 1997 omnibus appropriations (P.L. 104-208).
*** - **Adjusted for inflation** (this column only). Constant dollar conversions based on GDP deflators from *Budget of the United States Government FY 1997* . All other percentage changes are based on current (non-adjusted) dollars.

Preliminary - Complete information will be available in the forthcoming *Congressional Action on R&D in the FY 1997 Budget.*

Table C. Nondefense R&D: Comparisons between Budget Resolution Projections and Appropriations, FY 1997 (Preliminary - Oct. 7, 1996) (budget authority in millions of dollars)

	FY 1997 Budget Resolution	FY 1997 Approved	FY 1997 Change from Res.	% Change from Res.
NASA	9,316	9,263	-53	-0.6%
DOE nondefense	3,456	3,407	-49	-1.4%
HHS	11,925	12,998	1,073	9.0%
National Institutes of Health	*11,446*	*12,227*	*781*	6.8%
Nat'l Science Foundation	2,464	2,424	-40	-1.6%
Agriculture	1,489	1,543	54	3.6%
Interior	566	573	7	1.2%
Transportation	576	626	50	8.8%
EPA	490	593	103	21.1%
Commerce	880	1,004	124	14.0%
All Other	1,072	1,113	41	3.9%
Total Nondefense R&D	32,234	33,546	1,312	4.1%

Source: AAAS analysis of R&D as contained in FY 1997 appropriations bills, and AAAS analyses of projected effects on nondefense R&D of FY 1996 and FY 1997 congressional budget resolutions.

FY 1997 Budget Resolution figures are **projections** based on programmatic assumptions in the FY 1997 Budget Resolution.

Preliminary - Complete information will be available in the forthcoming *Congressional Action on R&D in the FY 1997 Budget.*